**Background**

- **What is Central Post-Stroke Pain (CPSP)?**
  - A neuropathic pain disorder resulting from an ischemic or hemorrhagic stroke that causes allodynia (pain to normally nonpainful stimuli) and dysesthesia (abnormal sensation)
- Brain stimulation is a nonpharmacological treatment for patients with CPSP
- Types of relevant non-invasive brain stimulation (Figure 1)
  - Repetitive transcranial magnetic stimulation (rTMS)
  - Transcranial direct current stimulation (tDCS)

**Purpose**

- To analyze the efficacy and quality of non-invasive brain stimulation intervention studies for CPSP in the chronic stroke population (> 6 months post stroke).

**Methods**

- Databases searched: PubMed, Embase, and Web of Science
- Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was applied
- Quality was assessed using the Modified Downs and Black checklist
  - Inclusion Criteria
    - Patients (18-85 years) post stroke with CPSP
    - Randomized controlled trials and observational studies (cohort, case-control, and cross-sectional studies) published in English journals between 2007-2017
    - Non-invasive brain stimulation (tDCS or rTMS)

**Results**

- 1107 articles found in initial search; 6 articles eligible for inclusion

**Study Parameters** (Table 1)

<table>
<thead>
<tr>
<th>Study Parameters</th>
<th>tDCS</th>
<th>rTMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
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<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>16</td>
</tr>
</tbody>
</table>

**Brain Stimulation Effects** (Table 2)

- Five studies found a decrease in clinical pain intensity (p<0.05) from immediately after to 3 weeks after, rTMS or tDCS delivered over the primary motor cortex
- One study tested rTMS to the left premotor/dorsolateral prefrontal cortex and failed to find a treatment effect for clinical pain (p>0.05)
- For experimental pain, one study found that tDCS delivered over the primary motor cortex reduced pain levels, as evidenced by decreased VAS and QST scores

**Quality Assessment** (Table 3)

<table>
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<th>Study Parameters</th>
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</thead>
<tbody>
<tr>
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<td>0</td>
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<tr>
<td>Total</td>
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</tbody>
</table>

**Conclusions**

- Non-invasive brain stimulation may have a therapeutic effect on pain levels, as evidenced by decreased VAS and QST scores
- Poor quality of the studies reviewed, and significant variation in parameters of stimulation and participant characteristics raises caution for drawing conclusions
- Future studies in this area should focus on standardizing treatment parameters, improving the homogeneity of the populations studied, and understanding if non-invasive brain stimulation is a sustainable long-term treatment for patients with CPSP

**Clinical Relevance**

- rTMS and tDCS may be effective non-invasive treatment options to reduce pain in persons with CPSP, and may provide a window of time for decreased pain and optimization of therapy treatments
- Clinicians should consider quality of evidence and length of effects

**References available upon request**